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MONTANA PETROLEUM SITUATION

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MONTANA PETROLEUM SITUATION

Reserves

Montana crude oil proved reserves as of December 31, 1975, are variously estimated as 255 million barrels by the Montana Department of Natural Resources and Conservation (DNR) and as 164 million barrels by the American Petroleum Institute (API). Table 1 presents a regional breakdown of these reserve estimates. Due to a lack of transportation facilities, only 36 percent of these reserves are available to the major Montana refineries. This amounts to about 59.1 million barrels (API) or 91.2 million barrels (DNR), giving a supply, at 1975 production rates, of about 6.0 years (API) to 9.3 years (DNR). The remaining 64 percent of reserves, currently dedicated for export, give a supply at 1975 production rates of about 4.6 years (API) to 7.1 years (DNR).

Crude Oil Pipeline Systems

Two major pipeline systems carry crude oil within Montana:

(1) The Butte pipeline system, along the eastern border;
(2) The Continental Oil Glacier pipeline system in the central part of Montana.

The Butte pipeline system gathers crude oil produced in Northeastern (Williston Basin) and Southeastern Montana (Powder River Basin) and transports it to Guernsey, Wyoming. From there, crude can be carried to the east and south, with most of Montana exports being delivered to the Midwest (see Table 2).

The Continental Oil Glacier pipeline system serves most of the refineries in Montana. The system carries Canadian crude oil and natural gas condensates, as well as Northern Montana crude oil, to the three Billings refineries and south into Wyoming. The Continental system also gathers the crude oil production of Central Montana for delivery to Billings.

Two other crude pipelines interconnect with the Continental Oil system. First, paralleling the Glacier line from the Cut Bank oil fields to Great Falls, a Phillips Petroleum pipeline can receive Canadian oil from the Continental line, plus Northern Montana crude, for delivery to the Phillips refinery in Great Falls. Second, an Exxon Oil pipeline delivers crude oil from the Big Horn Basin in Wyoming and Southcentral Montana to the Billings refineries.

Crude Oil Production and Processing

Eastern Montana

Crude oil production in the Williston Basin in Montana began in 1951, reaching a peak of almost 60,000 barrels per day (BPD) in 1966, and has declined steadily to 39,213 BPD in 1975. Production in the Powder River Basin began in 1966 and was about 23,854 BPD in 1975. These two regions have accounted for close to 70 percent of Montana production since 1968 (see Table 8).

Due to the lack of a pipeline system connecting the Eastern Montana oil fields with the major refineries in Billings, almost all production in the Williston and Powder River Basins has been exported. In the foreseeable future, this exportation can be expected to continue. Only the Tesoro refinery at Wolf Point is currently operating in Northeastern Montana. It has an input capacity of 2,500 BPD with an average throughput of about 1,700-1,900 BPD; feedstock is mainly Williston Basin crude with small Canadian inputs reported for 1974-1975.

Northern Montana

Northern Montana oil fields have been producing between 10,000 and 20,000 BPD since at least 1942. Historically, this crude oil has been processed in refineries in Northern Montana, although some Northern Montana crude has been refined in Billings since the Continental Oil pipeline was put into operation in 1962.

Three refineries are currently operating in Northern Montana: the Phillips refinery at Great Falls, the Wesco refinery at Cut Bank, and the Big West Oil refinery at Kevin. These refineries rely principally on Northern Montana crude production, but in recent years have begun to use significant amounts of Canadian crude as production has declined in Northern Montana oil fields. Phillip's 1975 Canadian crude inputs amounted to 433,000 barrels, for about 20 percent of its crude supply. Big West Oil reported Canadian crude inputs of 819,514 barrels in 1975, for about 67 percent of its total supply. Canadian imports to Wesco refinery were 165,701. barrels (13 percent of total feedstock).

Central and Southcentral Montana

Southcentral and Central Montana crude production declined since 50 percent from 1960 to 1970, but has been increasing slightly over 1970. These regions are the primary supply of the Montana crude refined in the three Billings area refineries.

The three refineries currently operating in the Billings area are the Continental Oil refinery, the Exxon Oil refinery, and the Farmer's Union refinery (Laurel). These three refineries account for over 88 percent of the refining capacity and throughput in Montana. Besides the Southcentral, and Central and some Northern Montana crude oils, these refineries have three other feedstocks:

(1) Canadian crude oil.
(2) Canadian natural gas condensates.
(3) Wyoming crude oil.

Typical analyses of gravity and sulfur content of feedstocks received by these refineries are shown in Table 3.

Canadian inputs to Continental Oil and Exxon Oil began in 1962 with the completion of the Glacier pipeline system. Inputs to Farmer's Union were reported beginning in 1970. Reliance on Canadian inputs has steadily increased, as the refineries expanded and adjusted to the lighter and sweeter Canadian crude oils and condensates, reaching a peak in 1973 of 23.1 million barrels and declining slightly to 18.9 million barrels in 1975. During the same time period (1960-1975), Wyoming inputs have increased with Montana inputs declining slightly. The Continental Oil refinery is the most dependant on Canadian inputs, especially the imported condensates. Relative volumes of supply by source of feedstock are summarized for 1975 in Table 4.

Crude Supply Problems and Proposed Solutions

The curtailment of Canadian crude oil and condensate exports, as well as declining Montana crude production, will create serious shortfalls in feedstock materials for the Montana refineries. The impact will be especially acute for Continental Oil due to its heavy reliance on Canadian natural gas condensates for which there is no available alternative supply.

Five potential alternative scenarios of feedstock supplies to Montana refineries have been identified, assuming continued curtailment of Canadian oil. These are:

(1) No Canadian feedstock, no replacement. This specifies the worst case which could occur. In this instance, all Canadian crude and condensate flowing into Montana would be curtailed and it is assumed that no domestic or international replacement would be available.

(2) No Canadian feedstock, some United States (lower 48 states) replacement. This assumes that some unspecified quantities of domestic feedstock would be available to partially replace lost Canadian feedstock.
(3) Softening of the Canadian position on condensate, but full curtailment of crude oil. In this case, Canadian condensate would continue to flow to Montana refineries, but all other feedstocks would be curtailed.
(4) Northern Tier pipeline bringing in Alaskan or other crude. This proposal would preclude port facilities at Port Angeles, Washington, and would transport crude from ocean tankers into the Northcentral portion of the United States (see Figure 1).
(5) Canadian west coast port facility and pipeline to Edmonton bringing Alaskan or other crude via the existing Canadian pipeline system to Montana. Recent indications are that this alternative would involve a port facility at or near Prince Rupert, B. C., with a new pipeline to a point west of Edmonton.

Some of the short-term alternatives for maintaining adequate levels of crude inputs being investigated include:

(1) Exchanges of crude with Canadian refineries to increase the amount of imported crude and condensate;
(2) Increasing production and purchases of Big Horn Basin, Wyoming, crude oil;
(3) Expansion of the market for asphalt, which would enable the refining of somewhat higher percentage of the heavy-sour domestic crudes;
(4) Refinery equipment changes to enable greater throughput of domestic crude oils.

In addition to equipment problems associated with the refining of larger volumes of heavy-sour domestic crude oil, limited excess pipeline capacity exists from Wyoming oil fields. The Exxon Oil pipeline reports excess capacity of about 5,000 BPD during 1975. The Continental Oil pipeline is undergoing alterations which will enable the pumping of crude both south to Wyoming and north from the Frannie oil field in Wyoming to Billings. Some Frannie crude oil is now received by Continental Oil in Billings via the Exxon line, but Continental's pipeline changes will significantly increase this volume.

Long-term solutions involve massive crude exchanges with Canadian refineries and/or construction of major new pipeline systems for delivery of Alaskan and foreign crudes to the northern tier states. Two pipelines have been proposed which would deliver crude directly to Montana and the other states:

(1) The Transprovincial Line (see Figure 1), involving a new pipeline from Prince Rupert, B. C., to Edmonton, Alberta;
(2) Northern Tier Pipeline (see Figure 1), involving a new pipeline from Seattle through Montana to Wisconsin.

Several other pipeline alternatives have been proposed, none of which would directly deliver feedstocks to Montana refineries (see Figure 1).

Finished Petroleum Products Supply

Four finished products pipelines serve Montana refineries and consumers. These are:

(1) The Yellowstone pipeline -- Billings to Spokane, Washington, with terminals in Bozeman, Helena, and Missoula, and a branch line from Helena to Great Falls;
(2) The Cenex (Farmer's Union) pipeline -- Laurel to Minot, North Dakota, with a terminal in Glendive;
(3) The Shosone pipeline -- Cody, Wyoming, to Billings;
(4) The Continental Oil line -- Billings to Sinclair, Wyoming.

These pipelines typically move the lighter fraction of petroleum products (i.e., gasoline, diesel fuel, and other distillates). The heavy fuel oils and asphalts are transported by truck and rail. In addition, all lubricating oils are imported into Montana by truck and rail. Some interstate truck movements of gasoline and distillates from Idaho and Canada have occurred in the past, and probably are continuing although the total volumes would be small.

Data for the historical consumption of petroleum products in Montana are given in Table 5. In addition to supplying Montana demand for most petroleum products, the three Billings area refineries export over 50 percent of their production to Washington, Idaho, Wyoming, and North Dakota.

Table 1

Montana Crude Oil Reserve Estimates
(million barrels)

Region	DNR[1] Estimate	Percent of Total	API[2,3] Estimate	Percent of Total
Northeastern Montana	125.0	49%	80.4	49%
Southeastern Montana	38.8	15%	24.6	15%
Central Montana	32.5	13%	21.3	13%
South Central Montana	10.2	4%	6.6	4%
Northern Montana	48.5	19%	31.2	19%
State Total	255.0	100%	164.0	100%

[1] Source: Montana Department of Natural Resources, Oil and Gas Conservation Division

[2] Source: American Petroleum Institute

[3] Regional breakdown for API estimate was made by using the regional percentages computed from the DNR estimates.

Table 2

Distribution of Montana Crude Oil Exports
by State of Destination
(thousand barrels)

Destination	1973	1974	1975
Pennsylvania	346	360	769
Illinois	3,096	2,608	2,236
Indiana	13,720	14,435	10,907
Kansas	1,638	1,065	1,020
Minnesota, Wisconsin	1,199	1,617	2,026
Missouri, Nebraska	0	80	654
North Dakota	1,065	1,374	1,304
Ohio	80	115	59
Oklahoma	0	50	0
Colorado	793	573	256
Wyoming	654	361	498
Utah	0	0	784
Total	22,591	22,638	20,513

Source: U. S. Bureau of Mines.

Table 3

Typical Analyses of Refinery Feedstocks

Refinery	Canadian Crude	Canadian Condensate	Montana Crude	Wyoming Crude
Continental				
Gravity	41.0	59.0	33.0	28.0
Sulfur (%)	0.6	0.65	0.5	2.0
Exxon Oil				
Gravity	40.0	55.0	32.0	28.0
Sulfur (%)	0.6	0.7	0.5	2.0
Farmer's Union				
Gravity	36.4	63.5	35.0	27.1
Sulfur (%)	0.64	0.49	1.08	2.34

Source: Individual refineries, Affadaivits submitted to FEA

Table 4

Sources of Feedstocks for Montana Refineries in 1975[P]

Refinery	Percent of Total Runs					
	Central Montana	S. Central Montana	Wyoming	Total Canadian	Canadian Crude	Canadian Condensate
Continental Oil	7%	3%	35%	56%	26%	31%
Exxon Oil	3%	2%	57%	37%	NA	NA
Farmer's Union	10%	3%	48%	39%	35%e/	4%e/
Total, 3 Refineries	7%	3%	46%	44%	NA	NA

NA - Not Available e/ estimated (from projected 1976 data)
P - Preliminary, subject to revisions as further information is received.
Source: Individual refineries, Affadavits submitted to FEA

Table 5

Montana Consumption of Petroleum Products
(million barrels)

Year	Gasoline[1]	Kerosine[2]	Distillate[2]	Residual[2]	LPG[2]
1950	5.4	0.2	2.5	4.2	0.2
1960	7.5	0.5	4.7	2.0	0.7
1965	9.3	0.2	5.0	1.2	0.9
1970	9.2	0.4	4.8	1.2	1.3
1972	10.4	0.4	6.1	1.5	1.7
1974	10.7	0.2	7.6	2.3	1.5

Year	Kerosine[3] Jet Fuel	Lubes[3]	Asphalts[3]	Other[3]	Total
1950	NA	NA	NA	NA	NA
1960	NA	NA	NA	NA	NA
1965	1.5	0.4	1.1	2.9	22.5
1970	1.5	0.4	1.5	3.3	23.6
1972	1.8	0.4	1.8	4.0	28.1
1974	1.5	0.4	1.8	4.0	30.0

[1] Source: Montana Department of Revenue

[2] Source: U.S. Bureau of Mines

[3] Source: Bonner and Moore Associates, Inc.

Table 6

Refinery Capacity Compared to Crude Oil throughput for 1974 and 1975

Region or Refinery	Total Operating Crude Oil throughput Capacity as of 1/1/75 (barrels/day)	Average Crude Oil throughput (barrels/day) [2]		Throughput as Percent of January 1, 1975 Capacity	
		1974	1975	1974	1975
United States Total	14,696,750	12,133,425 [3]	NA	82.6	NA
Montana Refineries					
Big West Oil, Kevin	5,123	3,997	3,312	78.0	64.7
Continental Oil, Billings	52,500	45,896	45,129	87.4	86.0
Exxon, Billings	45,000	39,362	41,370	87.5	91.9
Farmers Union, Laurel	41,650	30,663	30,625	73.6	73.5
Phillips Petr., Great Falls	6,000	5,852	5,912	97.5	98.5
Tesoro Petr., Wolf Point	2,500	1,679	1,890	67.2	75.6
Westco Ref., Cut Bank	4,658	4,203	3,540	90.2	76.0
Montana Total	157,431	131,652	131,778	83.6	83.7

2/ Source for Montana data: Montana Oil and Gas Conservation Division

3/ Source: U.S. Bureau of Mines

Table 7

Year	Total Crude Oil Refined in Montana by Source[p]						
	Montana	Percent of Total	Wyoming	Percent of Total	Canada	Percent of Total	Total
1953	7497	38.3	12112	61.7	0	0.0	19609
1954	9034	45.4	10865	54.5	0	0.0	19909*
1955	9858	46.8	11210	53.1	0	0.0	21081*
1956	9053	39.6	13720	60.0	88	0.4	22861
1957	9222	40.1	13665	59.5	92	0.4	22979
1958	9165	39.4	14089	60.5	12	0.1	23265
1959	10913	41.9	15141	58.1	4	0.0	26059
1960	10531	42.3	14383	57.7	21	0.1	24935
1961	9797	41.0	14038	58.8	33	0.1	23869
1962	11175	39.7	16708	59.4	266	0.9	28149
1963	11798	42.0	14745	52.5	1553	5.5	28097
1964	12292	38.4	15714	49.1	4002	12.5	32007
1965	11971	36.2	16416	49.7	4654	14.1	33041
1966	10626	31.8	18120	54.2	4684	14.0	33429
1967	10632	28.7	21393	57.7	5052	13.6	37078
1968	9690	23.7	20915	51.0	10347	25.2	40951
1969	9465	23.4	22130	54.7	8843	21.9	40438
1970	9080	21.5	19342	45.7	13908	32.8	42330
1971	9262	20.6	19732	43.8	16003	35.6	44997
1972	9049	18.7	19241	39.7	20175	41.6	48465
1973	9695	19.0	18235	35.8	23037	45.2	50967
1974	9321	19.4	16949	35.3	21783	45.3	48053
1975	8929	18.6	19796	41.2	19372	40.2	48099

* Includes 9,000 barrels from South Dakota in 1954 and 13,000 barrels from South Dakota in 1955.

p = preliminary, subject to revision as further information is received.

Source: Montana Oil and Gas Conservation Division

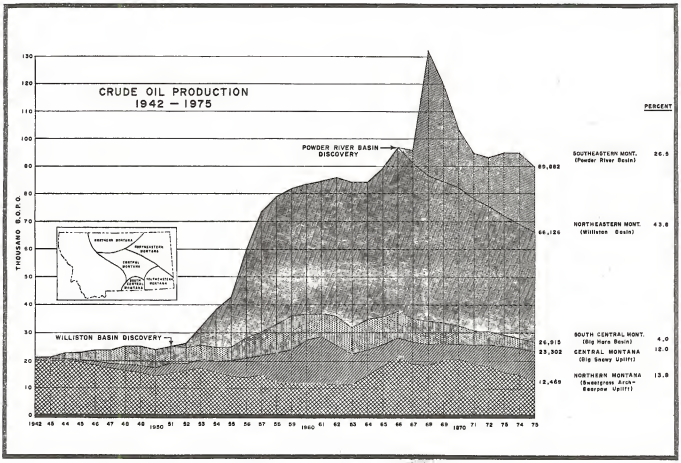
Table 8

Production and Refining of Montana Crude Oil
(Thousand Barrels)

Year	Northern Montana Production	Percent of Total Production	Northern Montana Refinery Inputs of Montana Crude Oil [P]	S. Central and Central Montana Production	Percent of Total Production	Billings Refineries Inputs of Montana Crude Oil	N. E. AND S.E. Montana Prod.	Percent of Total
1961	4,211	14	3,484	9,203	30	6,171	17,492	57
1962	4,252	13	3,524	9,131	29	7,227	18,265	58
1963	4,531	15	3,810	7,334	24	7,592	19,005	62
1964	5,706	19	3,386	6,970	23	8,730	17,971	59
1965	6,826	21	3,779	6,448	20	7,625	19,504	60
1966	7,991	23	3,708	6,103	17	6,170	21,286	60
1967	6,758	19	4,101	6,054	17	5,719	22,147	63
1968	6,883	14	4,411	5,614	12	4,429	35,963	74
1969	7,558	17	4,158	4,751	11	4,416	31,645	72
1970	7,681	20	4,444	4,244	11	3,796	25,954	69
1971	7,292	21	4,652	4,302	12	3,742	23,004	66
1972	6,647	20	4,596	4,560	13	3,671	22,697	67
1973	5,949	17	5,213	4,754	14	3,807	23,917	69
1974	5,464	16	5,049	4,768	14	3,683	24,322	70
1975	4,551	14	4,194	5,273	16	4,048	23,020	70

P = Preliminary.

Source: Montana Department of Natural Resources, Oil and Gas Conservation Division.


CRUDE OIL PRODUCTION
1942 — 1975
THOUSAND B.O.P.D.
PERCENT
POWDER RIVER BASIN DISCOVERY
WILLISTON BASIN DISCOVERY
SOUTHEASTERN MONT. (Powder River Basin) 26.5
89,882
NORTHEASTERN MONT. (Williston Basin) 43.8
66,124
SOUTH CENTRAL MONT. (Big Horn Basin) 4.0
26,915
CENTRAL MONTANA (Big Snowy Uplift) 12.0
23,302
NORTHERN MONTANA (Sweetgrass Arch-Kevanow Uplift) 13.8
12,469
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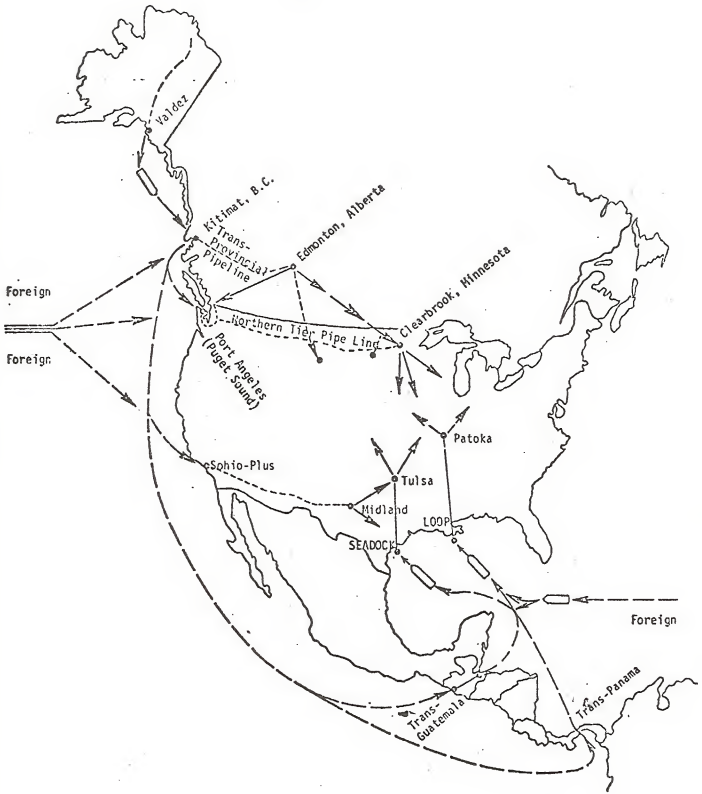

Figure 1 -Crude Supply Alternatives for The Northern Tier States